BELLSOUTH

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June 28, 2004

The Honorable Bruce F. Duke
Executive Director
Public Service Commission of SC
Post Office Drawer 11649
Columbia, South Carolina 29211

Re: Application of BellSouth Telecommunications, Inc. to Provide In-Region InterLATA Services Pursuant to Section 271 of the Telecommunications Act of 1996
Docket No. 2001-209-C

Dear Mr. Duke:

Enclosed for filing are an original and ten copies of BellSouth Telecommunications Inc.'s Notice of Filing a Revised Incentive Payment Plan in the above-captioned matter. By copy of this letter, I am serving all parties of record with a copy of this document as indicated on the attached Certificate of Service.

Sincerely,

Patrick W. Turner

Patrick W. Turner by nml w/ permission

PWT/nml
Enclosure
cc: All Parties of Record

BEFORE THE

PUBLIC SERVICE COMMISSION

OF SOUTH CAROLINA

DOCKET NO. 2001-209-C

IN RE:

BELLSOUTH	)
TELECOMMUNICATIONS, INC. -	)
APPLICATION TO PROVIDE IN-REGION	)
INTERLATA SERVICES PURSUANT TO	)
271 TELECOMMUNICATIONS ACT OF	)
1996 – SIX-MONTH REVIEW	)

BELLSOUTH TELECOMMUNICATIONS, INC.'S
NOTICE OF FILING A REVISED INCENTIVE PAYMENT PLAN

In Order No. 2004-100, dated March 10, 2004 ("the Review Order"), the Public Service Commission of South Carolina ("the Commission") made certain rulings regarding the South Carolina performance measurement plan for BellSouth, known as the Incentive Payment Plan ("IPP"). In the Review Order, the Commission ordered, among other things, a revised method of calculating IPP payments. BellSouth moved for reconsideration of this aspect of the Review Order, asserting, among other things, that the Commission's decision to revise the IPP remedy calculation methodology was not supported by evidence in the record of this proceeding. In Order No. 2004-257, dated May 14, 2004, the Commission denied BellSouth's Motion for Reconsideration and reaffirmed its decision regarding IPP payments.

BellSouth has revised the IPP in accordance with the Review Order. Accordingly, BellSouth respectfully submits herewith as Exhibit "A" an IPP South Carolina Administrative Plan, dated July 1, 2004, that complies with the Review Order.

Respectfully submitted, this 28th day of June, 2004.

BELLSOUTH TELECOMMUNICATIONS, INC.

Patrick W. Turner by mc w/permission

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EXHIBIT A

South Carolina Administrative Plan

Incentive Payment Plan (IPP)

South Carolina Exhibit PM-23

July 1, 2004

Contents

1: Administrative Plan

1.1 Scope

This Attachment includes Service Quality Measurements ("SQM") with corresponding Incentive Payment Plan ("IPP") applicable to this Agreement.

All exhibits referred to in this plan are located on the BellSouth Performance Measurement Reports website at: https://pmap.bellsouth.com

1.2 Reporting

In providing services pursuant to this Agreement, BellSouth will report its performance to each CLEC in accordance with BellSouth's SQMs and applicable IPPs, which are posted on the Performance Measurement Reports website.

BellSouth will make performance reports available to each CLEC on a monthly basis. The reports will contain information collected in each performance category and will be available to each CLEC via the Performance Measurements Reports website. BellSouth will also provide electronic access to the raw data underlying the SQMs.

Preliminary SQM reports will be posted on the Performance Measurements Reports website by 8:00 A.M. EST on the 21st day of each month or the first business day after the 21st for the previous month's performance. Final validated SQM reports will be posted by 8:00 A.M. EST on the last day of the month. SQM reports not posted by this time will be considered late for IPP purposes.

Preliminary IPP reports will be posted on the Performance Measurements Reports website by 8:00 A.M. EST on the last day of each month or the first business day after the last day of the month for the previous month's performance. Final validated IPP reports will be posted on the 15th of the month, following the final validated SQM report.

1.3 Modifications to Measurements

1.3.1 Service Quality Measurements

BellSouth will review the SQMs semi-annually. All modifications to the SQMs will be approved by the Commission. Each CLEC may provide input to BellSouth regarding any suggested additions, deletions or other modifications to the SQMs. BellSouth will provide notice of all changes to the SQMs via the Performance Measurement Reports website.

Notwithstanding the foregoing, BellSouth may, from time to time, be ordered by a regulatory or judicial body to modify or amend the SQMs. BellSouth will make all such changes to the SQMs pursuant to the Modification of Agreement Section of the General Terms and Conditions of the each CLECs Interconnection Agreement, incorporated herein by reference. Nothing herein shall preclude either party from participating in any proceeding involving BellSouth's SQMs or from advocating that those measurements be modified from those contained herein.

Notwithstanding any other provision of this document, in the event a dispute arises regarding the modification or amendment of the SQMs, the parties will refer the dispute to the Commission.

1.3.2 Incentive Payment Plan and Statistical Test

In order for BellSouth to accurately administer Enforcement Mechanisms, the IPPs shall be modified or amended only if BellSouth determines such modification or amendment is necessary. However, BellSouth will not delete any effective IPP without prior written consent of the Commission. BellSouth will notify each CLEC of any such modification or amendment to the IPPS via the Performance Measurement Reports website.

Notwithstanding the foregoing, BellSouth may, from time to time, be ordered by a regulatory or judicial body to modify or amend then IPPs and/or Statistical Test. BellSouth will make all such changes to the IPPs and/or Statistical Test pursuant to Modification of Agreement Section of the General Terms and Conditions of each CLECs Interconnection Agreement, incorporated herein by reference. Nothing herein shall preclude either party from participating in any proceeding involving the IPPs and/or Statistical Test or from advocating that those measurements or test be modified from those contained herein.

Notwithstanding any other provision of this document, in the event a dispute arises regarding the modification or amendment of the IPPs and/or Statistical Test, the parties will refer the dispute to the Commission.

1.4 Enforcement Mechanisms

1.4.1 Definitions

Enforcement Measurement Elements – the performance measurements identified as IPP measurements in the SQM.

Enforcement Measurement Benchmark – a competitive level of performance negotiated by BellSouth used to evaluate the performance of BellSouth and each CLEC where no analogous retail process, product or service is feasible.

Enforcement Measurement Compliance – comparing performance levels provided to BellSouth retail customers with performance levels provided by BellSouth to the CLEC

customer.

Test Statistic and Balancing Critical Value – the means by which enforcement will be determined using statistically valid equations. The Test Statistic and Balancing Critical Value are set forth in Exhibit D located on the Performance Measurements Reports website (labeled Appendix D attached), incorporated herein by this reference.

Cell – a grouping of transactions at which like-to-like comparisons are made. For example, all BellSouth retail POTS services, for residential customers, requiring a dispatch in a particular wire center, at a particular point in time will be compared directly to each CLEC resold services for residential customers, requiring a dispatch, in the same wire center, at a particular point in time. When determining compliance, these cells can have a positive or negative Test Statistic. See Exhibit C located on the Performance Measurements Reports website (labeled Appendix C attached), incorporated herein by this reference.

Affected Volume – that proportion of the total impacted each CLEC volume or CLEC Aggregate volume for which remedies will be paid.

Delta – a measure of the meainingful difference between BellSouth performance and CLEC performance. For individual CLECs the Delta value shall be 1.0 and for the CLEC aggregate the Delta value shall be 0.5.

Parity Gap – refers to the incremental departure from a compliant-level of service. This is also referred to as "diff" in the Statistical paper located at Exhibit C located on the Performance Measurements Reports website (labeled Appendix C attached), incorporated herein by this reference.

Tier-1 Enforcement Mechanisms – self-executing liquidated damages paid directly to each CLEC when BellSouth delivers non-compliant performance of any one of the Tier-1 Enforcement Measurement Elements for any month as calculated by BellSouth.

Tier-2 Enforcement Mechanisms – Assessments paid directly to the Commission or its designee. Tier 2 Enforcement Mechanisms are triggered by three consecutive monthly failures in which BellSouth performance is out of compliance or does not meet the benchmarks for the aggregate of all CLEC data as calculated by BellSouth for a particular Tier-2 Enforcement Measurement Element.

Application – The Enforcement Mechanisms set forth in this section shall only become effective upon an effective FCC order, which has not been stayed, authorizing BellSouth to provide interLATA telecommunications services under section 271 of the Act within a particular state and shall only apply to BellSouth's performance in any state in which the FCC has granted such interLATA authority.

The application of the Tier-1 and Tier-2 Enforcement Mechanisms does not foreclose other legal and regulatory claims and remedies available to each CLEC.

Payment of any Tier-1 or Tier-2 Enforcement Mechanisms shall not be considered as an admission against interest or an admission of liability or culpability in any legal, regulatory

or other proceeding relating to BellSouth's performance. The payment of any Tier-1 Enforcement Mechanisms to each CLEC shall be credited against any liability associated with or related to BellSouth's service performance.

It is not the intent of the Parties that BellSouth be liable for both Tier-2 Enforcement Mechanisms and any other assessments or sanctions imposed by the Commission. Each CLEC will not oppose any effort by BellSouth to set off Tier-2 Enforcement Mechanisms from any additional assessment imposed by the Commission.

Each CLEC acknowledges and argues that the Enforcement Mechanisms contained in this attachment have been provided by BellSouth on a completely voluntary basis in order to maintain compliance between BellSouth and each CLEC. Therefore, each CLEC may not use the existence of this section or any payments of any Tier-1 or Tier-2 Enforcement Mechanisms under this section as evidence that BellSouth has not complied with or has violated any state or federal law or regulation.

1.4.2 Methodology

Tier-1 Enforcement Mechanisms will be triggered by BellSouth's failure to achieve applicable Enforcement Measurement Compliance or Enforcement Measurement Benchmarks for each CLEC for the State for a given Enforcement Measurement Element in a given month. Enforcement Measurement Compliance is based upon a Test Statistic and Balancing Critical Value calculated by BellSouth utilizing BellSouth generated data. The method of calculation is set forth in Exhibit D located on the Performance Measurements Reports website (labeled Appendix D attached), incorporated herein by this reference.

Tier-1 Enforcement Mechanisms apply on a per transaction basis for each negative cell and will escalate based upon the number of consecutive months that BellSouth has reported non-compliance.

Fee Schedule for Tier-1 Enforcement Mechanisms is shown on the Performance Measurement Reports website in Table-1 of Exhibit A (labeled Appendix A attached), incorporated herein by this reference. Failures beyond Month 6 will be subject to Month 6 fees.

Tier-2 Enforcement Mechanisms will be triggered by BellSouth's failure to achieve applicable Enforcement Measurement Compliance or Enforcement Measurement Benchmarks for the State for given Enforcement Measurement Elements for three consecutive months based upon a statistically valid equation calculated by BellSouth utilizing BellSouth generated data. The method of calculation is set forth in Exhibit D located on the Performance Measurements Reports website (labeled Appendix D attached), incorporated herein by this reference.

Tier- 2 Enforcement Mechanisms apply, for an aggregate of all CLEC data generated by BellSouth, on a per transaction basis for each negative cell for a particular Enforcement Measurement Element.

Fee Schedule for Total Quarterly Tier-2 Enforcement Mechanisms is shown on the Performance Measurement Reports website in Table-2 of Exhibit A (labeled Appendix A attached), incorporated herein by this reference.

1.4.3 Payment of Tier-1 and Tier-2 Amounts

If BellSouth performance triggers an obligation to pay Tier-1 Enforcement Mechanisms to each CLEC or an obligation to remit Tier-2 Enforcement Mechanisms to the Commission or its designee, BellSouth shall make payment in the required amount on the day upon which the final validated IPP reports are posted on the Performance Measurements Reports website as set forth in Section 2.4 above.

For each day after the due date that BellSouth fails to pay each CLEC the required amount, BellSouth will pay each CLEC 6% simple interest per annum.

For each day after the due date that BellSouth fails to pay the Tier-2 Enforcement Mechanisms, BellSouth will pay the Commission an additional $1,000 per day.

If each CLEC disputes the amount paid to each CLEC for Tier-1 Enforcement Mechanisms, each CLEC shall submit a written claim to BellSouth within sixty (60) days after the date of the performance measurement report for which the obligation arose. BellSouth shall investigate all claims and provide each CLEC written findings within thirty (30) days after receipt of the claim. If BellSouth determines each CLEC is owed additional amounts, BellSouth shall pay each CLEC such additional amounts within thirty (30) days after its findings along with 6% simple interest per annum.

At the end of each calendar year, BellSouth will have its independent auditing and accounting firm certify that the results of all Tier-1 and Tier-2 Enforcement Mechanisms were paid and accounted for in accordance with Generally Accepted Account Principles (GAAP).

1.4.4 Limitations of Liability

BellSouth will not be responsible for each CLEC acts or omissions that cause performance measures to be missed or fail, including but not limited to accumulation and submission of orders at unreasonable quantities or times or failure to submit accurate orders or inquiries. BellSouth shall provide each CLEC with reasonable notice of such acts or omissions and provide each CLEC any such supporting documentation.

BellSouth shall not be obligated for Tier-1 or Tier-2 Enforcement Mechanisms for non-compliance with a performance measure if such non-compliance was the result of an act or omission by each CLEC that is in bad faith.

BellSouth shall not be obligated to pay Tier-1 Enforcement Mechanisms or Tier-2 Enforcement Mechanism for non-compliance with a performance measurement if such non-compliance was the result of any of the following: a Force Majeure event as set forth in the

General Terms and Conditions of this Agreement; an act or omission by each CLEC that is contrary to any of its obligations under its Interconnection Agreement with BellSouth; an act or omission by each CLEC that is contrary to any of its obligations under the Act, Commission rule, or state law; an act or omission associated with third-party systems or equipment.

1.4.5 Enforcement Mechanism Cap

BellSouth's total liability for the payment of Tier-1 and Tier-2 Enforcement Mechanisms shall be collectively capped at 36% of net revenue per year.

If projected payments exceed the state cap, a proportional payment will be made to the respective parties.

If BellSouth's payment of Tier-1 and Tier-2 Enforcement Mechanisms would have exceeded the cap referenced in this attachment, each CLEC may commence a proceeding with the Commission to demonstrate why BellSouth should pay any amount in excess of the cap. Each CLEC shall have the burden of proof to demonstrate why, under the circumstances, BellSouth should have additional liability.

1.4.6 Dispute Resolution

Notwithstanding any other provision of this document, any dispute regarding BellSouth's performance or obligations pursuant to this Attachment shall be resolved by the Commission.

A: Fee Schedule

A.1 Liquidated Damages for Tier-1 Measures (per affected item)

Per Affected Item						
	Month 1	Month 2	Month3	Month4	Month 5	Month 6
Pre-Ordering	$20	$30	$40	$50	$60	$70
Ordering	$40	$50	$60	$70	$80	$90
Provisioning	$100	$125	$175	$250	$325	$500
Provisioning UNE (Coordinated Customer Conversions)	$400	$450	$500	$550	$650	$800
Maintenance and Repair	$100	$125	$175	$250	$325	$500
Maintenance and Repair UNE	$400	$450	$500	$550	$650	$800
LNP	$150	$250	$500	$600	$700	$800
Billing	$1.00	$1.00	$1.00	$1.00	$1.00	$1.00
IC Trunks	$100	$125	$175	$250	$325	$500
Collocation	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000

A.2 Table 2: Remedy Payments for Tier-2 Measures

	Per Affected Item
OSS/Pre-Ordering	$20
Ordering	$60
Provisioning	$300
Provisioning-UNE (Coordinated Customer Conversions)	$875
Maintenance and Repair	$300
Maintenance and Repair-UNE	$875
Billing	$1.00

LNP	$500
IC Trunks	$500
Collocation	$15,000
Change Management	$1,000
Service Order Accuracy	$50

B: IPP Submetrics

B.1 Tier 1 Submetrics

Table 1 contains a list of Tier 1 submetrics.

Table 1: Tier 1 Submetrics

Item No.	Submetric
1	Firm Order Confirmation and Reject Response Completeness – Fully Mechanized
2	Percent Missed Installation Appointments – Resale POTS
3	Percent Missed Installation Appointments – Resale Design
4	Percent Missed Installation Appointments – UNE Loop and Port Combinations
5	Percent Missed Installation Appointments – UNE Loops
6	Percent Missed Installation Appointments – UNE xDSL
7	Percent Missed Installation Appointments – UNE Line Sharing
8	Percent Missed Installation Appointments – Local IC Trunks
9	Average Completion Interval – Resale POTS
10	Average Completion Interval – Resale Design
11	Average Completion Interval – UNE Loop and Port Combinations
12	Average Completion Interval – UNE Loops
13	Average Completion Interval – UNE xDSL
14	Average Completion Interval – UNE Line Sharing
15	Average Completion Interval – Local IC Trunks
16	Coordinated Customer Conversions Interval – Unbundled Loops
17	Coordinated Customer Conversions – Hot Cut Timeliness Percent within interval - UNE Loops
18	Coordinated Customer Conversions – Percent Provisioning Troubles Received within 7 days of a completed service order – UNE Loops
19	Percent Provisioning Troubles within 30 days of Service Order Completion – Resale POTS
20	Percent Provisioning Troubles within 30 days of Service Order Completion – Resale Design
21	Percent Provisioning Troubles within 30 days of Service Order Completion – UNE Loop and Port Combinations
22	Percent Provisioning Troubles within 30 days of Service Order Completion – UNE Loops
23	Percent Provisioning Troubles within 30 days of Service Order Completion – UNE xDSL
24	Percent Provisioning Troubles within 30 days of Service Order Completion – UNE Line Sharing

25	Percent Provisioning Troubles within 30 days of Service Order Completion – Local IC Trunks
26	LNP – Percent Missed Installation Appointments
27	Missed Repair Appointments – Resale POTS
28	Missed Repair Appointments – Resale Design
29	Missed Repair Appointments – UNE Loop and Port Combinations
30	Missed Repair Appointments – UNE Loops
31	Missed Repair Appointments – UNE xDSL
32	Missed Repair Appointments – UNE Line Sharing
33	Missed Repair Appointments – Local IC Trunks
34	Customer Trouble Report Rate – Resale POTS
35	Customer Trouble Report Rate – Resale Design
36	Customer Trouble Report Rate – UNE Loop and Port Combinations
37	Customer Trouble Report Rate – UNE Loops
38	Customer Trouble Report Rate – UNE xDSL
39	Customer Trouble Report Rate – UNE Line Sharing
40	Customer Trouble Report Rate – Local IC Trunks
41	Maintenance Average Duration – Resale POTS
42	Maintenance Average Duration – Resale Design
43	Maintenance Average Duration – UNE Loop and Port Combinations
44	Maintenance Average Duration – UNE Loops
45	Maintenance Average Duration – UNE xDSL
46	Maintenance Average Duration – UNE Line Sharing
47	Maintenance Average Duration – Local IC Trunks
48	Percent Repeat Troubles within 30 days – Resale POTS
49	Percent Repeat Troubles within 30 days – Resale Design
50	Percent Repeat Troubles within 30 days – UNE Loop and Port Combinations
51	Percent Repeat Troubles within 30 days – UNE Loops
52	Percent Repeat Troubles within 30 days – UNE xDSL
53	Percent Repeat Troubles within 30 days – UNE Line Sharing
54	Percent Repeat Troubles within 30 days – Local IC Trunks
55	Trunk Group Performance – CLEC Trunk Group
56	Collocation Percent of Due Dates Missed

B.2 Tier 2 Submetrics

Table 2 contains a list of Tier 2 submetrics.

Table 2: Tier 2 Submetrics

Item No.	Tier 2 Sub Metrics
1	Average Response Time - Pre-Ordering/Ordering
2	Interface Availability - Pre-Ordering/Ordering
3	Interface Availability - Maintenance & Repair
4	Loop Makeup - Response Time - Manual
5	Loop Makeup - Response Time - Electronic
6	Acknowledgement Message Timeliness - EDI
7	Acknowledgement Message Timeliness - TAG
8	Acknowledgement Message Completeness EDI
9	Acknowledgement Message Completeness TAG
10	Percent Flow-through Service Requests (Summary)
11	Reject Interval
12	Firm Order Confirmation Timeliness
13	Firm Order Confirmation and Reject Response Completeness - Fully Mechanized
14	Percent Missed Installation Appointments - Resale POTS
15	Percent Missed Installation Appointments - Resale Design
16	Percent Missed Installation Appointments - UNE Loop and Port Combinations
17	Percent Missed Installation Appointments - UNE Loops
18	Percent Missed Installation Appointments - UNE xDSL
19	Percent Missed Installation Appointments - UNE Line Sharing
20	Percent Missed Installation Appointments - Local IC Trunks
21	Average Completion Interval - Resale POTS
22	Average Completion Interval - Resale Design
23	Average Completion Interval - UNE Loop and Port Combinations
24	Average Completion Interval - UNE Loops
25	Average Completion Interval - UNE xDSL
26	Average Completion Interval - UNE Line Sharing
27	Average Completion Interval - Local IC Trunks
28	Coordinated Customer Conversions Interval - Unbundled Loops
29	Coordinated Customer Conversions - Hot Cut Timeliness Percent within interval - UNE Loops
30	Coordinated Customer Conversions - Percent Provisioning Troubles Received within 7 days of a completed service order - UNE Loops
31	Cooperative Acceptance Testing - Percent UNE xDSL Loops Tested
32	Percent Provisioning Troubles within 30 days of Service Order Completion - Resale POTS
33	Percent Provisioning Troubles within 30 days of Service Order Completion - Resale Design

34	Percent Provisioning Troubles within 30 days of Service Order Completion - UNE Loop and Port Combinations
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50	Customer Trouble Report Rate - UNE Loops
51	Customer Trouble Report Rate - UNE xDSL
52	Customer Trouble Report Rate - UNE Line Sharing
53	Customer Trouble Report Rate - Local IC Trunks
54	Maintenance Average Duration - Resale POTS
55	Maintenance Average Duration - Resale Design
56	Maintenance Average Duration - UNE Loop and Port Combinations
57	Maintenance Average Duration - UNE Loops
58	Maintenance Average Duration - UNE xDSL
59	Maintenance Average Duration - UNE Line Sharing
60	Maintenance Average Duration - Local IC Trunks
61	Percent Repeat Troubles within 30 days - Resale POTS
62	Percent Repeat Troubles within 30 days - Resale Design
63	Percent Repeat Troubles within 30 days - UNE Loop and Port Combinations
64	Percent Repeat Troubles within 30 days - UNE Loops
65	Percent Repeat Troubles within 30 days - UNE xDSL
66	Percent Repeat Troubles within 30 days - UNE Line Sharing
67	Percent Repeat Troubles within 30 days - Local IC Trunks
68	Invoice Accuracy
69	Mean Time to Deliver Invoices

70	Usage Data Delivery Accuracy
71	Trunk Group Performance - Aggregate
72	Collocation Percent of Due Dates Missed
73	Timeliness of Change Management Notices
74	Timeliness of Documents Associated with Change
75	Service Order Accuracy - Resale Residence
76	Service Order Accuracy - Resale Business
77	Service Order Accuracy - Resale Design (Specials)
78	Service Order Accuracy - UNE Specials (Design)
79	Service Order Accuracy - UNE (Non-Design)
80	Service Order Accuracy - Local Interconnection Trunks

C: Statistical Properties and Definitions

C.1 Necessary Properties for a Test Methodology

The statistical process for testing if competing local exchange carriers (CLECs) customers are being treat equally with BellSouth (BST) customers involves more than just a mathematical formula. Three key elements need to be considered before an appropriate decision process can be developed. These are

- the type of data,
- the type of comparison, and
- the type of performance measure.

Once these elements are determined a test methodology should be developed that complies with the following properties.

- *Like-to-Like Comparisons* – When possible, data should be compared at appropriate levels, e.g. wire center, time of month, dispatched, and residential, new orders. The testing process should:
  - Identify variables that may affect the performance measure.
  - Record these important confounding covariates.
  - Adjust for the observed covariates in order to remove potential biases and to make the CLEC and the ILEC units as comparable as possible.

- *Aggregate Level Test Statistic* – Each performance measure of interest should be summarized by one overall test statistic giving the decision maker a rule that determines whether a statistically significant difference exists. The test statistic should have the following properties.
  - The method should provide a single overall index, on a standard scale.
  - If entries in comparison cells are exactly proportional over a covariate, the aggregated index should be very nearly the same as if comparisons on the covariate had not been done.
  - The contribution of each comparison cell should depend on the number of observations in the cell.
  - Cancellation between comparison cells should be limited.
  - The index should be a continuous function of the observations.

- *Production Mode Process* – The decision system must be developed so that it does not require intermediate manual intervention, i.e. the process must be a "black box."
  - Calculations are well defined for possible eventualities.
  - The decision process is an algorithm that needs no manual intervention.
  - Results should be arrived at in a timely manner.

- The system must recognize that resources are needed for other performance measure-related processes that also must be run in a timely manner.
- The system should be auditable, and adjustable over time.

- *Balancing* – The testing methodology should balance Type I and Type II Error probabilities.
  - P(Type I Error) = P(Type II Error) for well defined null and alternative hypotheses.
  - The formula for a test's balancing critical value should be simple enough to calculate using standard mathematical functions, i.e. one should avoid methods that require computationally intensive techniques.
  - Little to no information beyond the null hypothesis, the alternative hypothesis, and the number of observations should be required for calculating the balancing critical value.
- *Trimming* – Removing extreme observations from BellSouth and CLEC distributions is needed in order to ensure that a fair comparison is made between performance measures. Three conditions are needed to accomplish this goal. These are:
  - Trimming should be based on a general rule that can be used in a production setting.
  - Trimmed observations should not simply be discarded; they need to be examined and possibly used in the final decision making process.
  - Trimming should only be used on performance measures that are sensitive to "outliers."

C.1.1 Measurement Types

The performance measures that will undergo testing are of four types:

- means
- proportions,
- rates, and
- ratio

While all four have similar characteristics, proportions and rates are derived from count data while means and ratios are derived from interval measurements.

C.2 Testing Methodology – The Truncated Z

Many covariates are chosen in order to provide deep comparison levels. In each comparison cell, a Z statistic is calculated. The form of the Z statistic may vary depending on the performance measure, but it should be distributed approximately as a standard normal, with mean zero and variance equal to one. Assuming that the test statistic is derived so that it is negative when the performance for the CLEC is worse than for the ILEC, a positive truncation is done – i.e. if the result is negative it is left alone, if the result is positive it is changed to zero. A weighted average of the truncated statistics is calculated where a cell weight depends on the volume of BST and CLEC orders in the cell. The weighted average is re-centered by the theoretical mean of a truncated distribution, and this is divided by the standard error of the weighted average. The standard error is computed assuming a fixed effects model.

C.2.1 Proportion Measures

For performance measures that are calculated as a proportion, in each adjustment cell, the truncated Z and the moments for the truncated Z can be calculated in a direct manner. In adjustment cells where proportions are not close to zero or one, and where the sample sizes are reasonably large, a normal approximation can be used. In this case, the moments for the truncated Z come directly from properties of the standard normal distribution. If the normal approximation is not appropriate, then the Z statistic is calculated from the hypergeometric distribution. In this case, the moments of the truncated Z are calculated exactly using the hypergeometric probabilities.

C.2.2 Rate Measures

The truncated Z methodology for rate measures has the same general structure for calculating the Z in each cell as proportion measures. For a rate measure, there are a fixed number of circuits or units for the CLEC, n_{2j} and a fixed number of units for BST, n_{1j}. Suppose that the performance measure is a "trouble rate." The modeling assumption is that the occurrence of a trouble is independent between units and the number of troubles in n circuits follows a Poisson distribution with mean λ_n where λ is the probability of a trouble in 1 circuit and n is the number of circuits.

In an adjustment cell, if the number of CLEC troubles is greater than 15 and the number of BST troubles is greater than 15, then the Z test is calculated using the normal approximation to the Poisson. In this case, the moments of the truncated Z come directly from properties of the standard normal distribution. Otherwise, if there are very few troubles, the number of CLEC troubles can be modeled using a binomial distribution with n equal to the total number of troubles (CLEC plus BST troubles.) In this case, the moments for the truncated Z are calculated explicitly using the binomial distribution.

C.2.3 Mean Measures

For mean measures, an adjusted "t" statistic is calculated for each like-to-like cell which has at least 7 BST and 7 CLEC transactions. A permutation test is used when one or both of the BST and CLEC sample sizes is less than 6. Both the adjusted "t" statistic and the permutation calculation are described in Statistical Formulas and Technical Description.

C.2.4 Ratio Measures

Rules will be given for computing a cell test statistic for a ratio measure, however, the current plan for measures in this category, namely billing accuracy, does not call for the use of a Z parity statistic.

D: Statistical Formulas and Technical Description

We start by assuming that any necessary trimming[1] of the data is complete, and that the data are disaggregated so that comparisons are made within appropriate classes or adjustment cells that define "like" observations.

D.1 Notation and Exact Testing Distributions

Below, we have detailed the basic notation for the construction of the truncated z statistic. In what follows the word "cell" should be taken to mean a like-to-like comparison cell that has both one (or more) ILEC observation and one (or more) CLEC observation.

$L =$ the total number of occupied cells

$j =$ 1,...,L; an index for the cells

$n_{1j} =$ the number of ILEC transactions in cell j

$n_{2j} =$ the number of CLEC transactions in cell j

$n_j =$ the total number transactions in cell j; $n_{1j} + n_{2j}$

$X_{1jk} =$ individual ILEC transactions in cell j; k = 1, , n_{1j}

$X_{2jk} =$ individual CLEC transactions in cell j; k = 1, , n_{2j}

$Y_{jk} =$ individual transaction (both ILEC and CLEC) in cell j

$$= \begin{cases} X_{1jk} & k = 1,\ldots,n_{1j} \\ X_{2jk} & k = n_{1j}+1,\ldots,n_j \end{cases}$$

$\Phi^{-1}(\cdot) =$ the inverse of the cumulative standard normal distribution function

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1 When it is determined that a measure should be trimmed, a trimming rule that is easy to implement in a production setting is:

Trim the ILEC observations to the largest CLEC value from all CLEC observations in the month under consideration.

That is, no CLEC values are removed; all ILEC observations greater than the largest CLEC observation are trimmed.

$\overline{X}_{1j}$ = The ILEC sample mean of cell j

$\overline{X}_{2j}$ = The CLEC sample mean of cell j

s_{1j}^2 = The ILEC sample variance in cell j

s_{2j}^2 = The CLEC sample variance in cell j

$\{y_{jk}\}$ = a random sample of size n_{2j} from the set of $Y_{j1},\ldots,Y_{jn_j}$; k = 1, ,n_{2j}

M_j = The total number of distinct pairs of samples of size n_{1j} and n_{2j};

$$= \binom{n_j}{n_{1j}}$$

The exact parity test is the permutation test based on the "modified Z" statistic. For large samples, we can avoid permutation calculations since this statistic will be normal (or Student's t) to a good approximation. For small samples, where we cannot avoid permutation calculations, we have found that the difference between "modified Z" and the textbook "pooled Z" is negligible. We therefore propose to use the permutation test based on pooled Z for small samples. This decision speeds up the permutation computations considerably, because for each permutation we need only compute the sum of the CLEC sample values, and not the pooled statistic itself.

A permutation probability mass function distribution for cell j, based on the "pooled Z" can be written as

$$PM(t) = P(\sum_k y_{jk} = t) = \frac{\textit{the number of samples that sum to } t}{M_j}$$

and the corresponding cumulative permutation distribution is

$$CPM(t) = P(\sum_k y_{jk} \le t) = \frac{\textit{the number of samples with sum } \le t}{M_j}$$

For Proportion Performance Measures the following notation is defined

a_{1j} = The number of ILEC cases possessing an attribute of interest in cell j

a_{2j} = The number of CLEC cases possessing an attribute of interest in cell j

a_j = The number of cases possessing an attribute of interest in cell j; $a_{1j}+ a_{2j}$

The exact distribution for a parity test is the hypergeometric distribution. The hypergeometric probability mass function distribution for cell j is

$$HG(h) = P(H = h) = \begin{cases} \dfrac{\binom{n_{1j}}{h}\binom{n_{2j}}{a_j - h}}{\binom{n_j}{a_j}}, & \max(0, a_j - n_{2j}) \le h \le \min(a_j, n_{1j}) \\ 0 & \text{otherwise} \end{cases}$$

and the cumulative hypergeometric distribution is

$$CHG(x) = P(H \le x) = \begin{cases} 0 & x < \max(0, a_j - n_{2j}) \\ \sum_{h=\max(0,a_j-n_{1j})}^{x} HG(h), & \max(0, a_j - n_{2j}) \le x \le \min(a_j, n_{1j}) \\ 1 & x > \min(a_j, n_{1j}) \end{cases}$$

For Rate Measures, the notation needed is defined as

b_{1j} = The number of ILEC base elements in cell j

b_{2j} = The number of CLEC base elements in cell j

b_j = The total number of base elements in cell j; $b_{1j} + b_{2j}$

$\hat{r}_{1j}$ = The ILEC sample rate of cell j; n_{1j}/b_{1j}

$\hat{r}_{2j}$ = The CLEC sample rate of cell j; n_{2j}/b_{2j}

q_j = The relative proportion of ILEC elements for cell j; b_{1j}/b_j

The exact distribution for a parity test is the binomial distribution. The binomial probability mass function distribution for cell j is

$$BN(k) = P(B = k) = \begin{cases} \binom{n_j}{k} q_j^k (1 - q_j)^{n_j - k}, & 0 \le k \le n_j \\ 0 & \text{otherwise} \end{cases}$$

and the cumulative binomial distribution is

$$CBN(x) = P(B \le x) = \begin{cases} 0 & x < 0 \\ \sum_{k=0}^{x} BN(k), & 0 \le x \le n_j \\ 1 & x > n_j \end{cases}$$

For Ratio Performance Measures the following additional notation is needed.

U_{1jk} = additional quantity of interest of an individual ILEC transaction in cell j; k = 1, , n_{1j}

U_{2jk} = additional quantity of interest of an individual CLEC transaction in cell j; k = 1, , n_{2j}

$\hat{R}_{ij}$ = the ILEC (I = 1) or CLEC (i = 2) ratio of the total additional quantity of interest to the base transaction total in cell j, i.e., $\sum_k U_{ijk} \Big/ \sum_k X_{ijk}$

D.2 Calculating the Truncated Z

The general methodology for calculating an aggregate level test statistic is outlined below.

D.2.1 Calculate Cell Weights (W_j)

A weight based on the number of transactions is used so that a cell, which has a larger number of transactions, has a larger weight. The actual weight formulae will depend on the type of measure.

Mean or Ratio Measure

$$W_j = \sqrt{\frac{n_{1j} n_{2j}}{n_j}}$$

Proportion Measure

$$W_j = \sqrt{\frac{n_{2j} n_{1j}}{n_j} \cdot \frac{a_j}{n_j} \cdot \left(1 - \frac{a_j}{n_j}\right)}$$

Rate Measure

$$W_j = \sqrt{\frac{b_{1j} b_{2j}}{b_j} \cdot \frac{n_j}{b_j}}$$

D.2.2 Calculate a Z Value (Z_j) for each Cell

A Z statistic with mean 0 and variance 1 is needed for each cell.

- If $W_j = 0$, set $Z_j = 0$.

- Otherwise, the actual Z statistic calculation depends on the type of performance measure.

Mean Measure

$$Z_j = \Phi^{-1}(\alpha)$$

where α is determined by the following algorithm.

If $\min(n_{1j}, n_{2j}) > 6$, then determine α as

$$\alpha = P(t_{n_{1j}-1} \le T_j)$$

that is, α is the probability that a t random variable with $n_{1j} - 1$ degrees of freedom, is less than

$$T_j = \begin{cases} t_j + \frac{g}{6}\left(\frac{n_{1j}+2n_{2j}}{\sqrt{n_{1j}\,n_{2j}(n_{1j}+n_{2j})}}\right)\left(t_j^2 + \frac{n_{2j}-n_{1j}}{n_{1j}+2n_{2j}}\right) & t_j \ge t_{\min j} \\ t_j + \frac{g}{6}\left(\frac{n_{1j}+2n_{2j}}{\sqrt{n_{1j}\,n_{2j}(n_{1j}+n_{2j})}}\right)\left(t_{\min j}^2 + \frac{n_{2j}-n_{1j}}{n_{1j}+2n_{2j}}\right) & \text{otherwise} \end{cases}$$

where

$$t_j = \frac{\bar{X}_{1j} - \bar{X}_{2j}}{s_{1j}\sqrt{\frac{1}{n_{1j}} + \frac{1}{n_{2j}}}}$$

$$t_{\min j} = \frac{-3\sqrt{n_{1j}n_{2j}n_j}}{g(n_{1j}+2n_{2j})}$$

and g is the median value of all values of

$$\gamma_{1j} = \frac{n_{1j}}{(n_{1j}-1)(n_{1j}-2)}\sum_k\left(\frac{X_{1jk} - \bar{X}_{1j}}{s_{1j}}\right)^3$$

with $n_{1j} > n_{3q}$ for all values of j. n_{3q} is the 3 quartile of all values of n_{1j}.

Note, that t_j is the "modified Z" statistic. The statistic T_j is a "modified Z" corrected for the skewness of the ILEC data.

If $\min(n_{1j}, n_{2j}) \le 6$, and

- $M_j \leq 1{,}000$ (the total number of distinct pairs of samples of size n_{1j} and n_{2j} is 1,000 or less).
  - Calculate the sample sum for all possible samples of size n_{2j}.
  - Rank the sample sums from smallest to largest. Ties are dealt by using average ranks.
  - Let R_0 be the rank of the observed sample sum with respect all the sample sums.

$$\alpha = 1 - \frac{R_0 - 0.5}{M_j}$$

- $M_j > 1{,}000$
  - Draw a random sample of 1,000 sample sums from the permutation distribution.
  - Add the observed sample sum to the list. There are a total of 1001 sample sums. Rank the sample sums from smallest to largest. Ties are dealt by using average ranks.
  - Let R_0 be the rank of the observed sample sum with respect all the sample sums.

$$\alpha = 1 - \frac{R_0 - 0.5}{1001}$$

Proportion Measure

$$Z_j = \frac{n_j\, a_{1j} - n_{1j}\, a_j}{\sqrt{\frac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}$$

Rate Measure

$$Z_j = \frac{n_{1j} - n_j\, q_j}{\sqrt{n_j\, q_j (1 - q_j)}}$$

Ratio Measure

$$Z_j = \frac{\hat{R}_{1j} - \hat{R}_{2j}}{\sqrt{V(\hat{R}_{1j})\left(\frac{1}{n_{1j}} + \frac{1}{n_{2j}}\right)}}$$

$$V(\hat{R}_{1j}) = \frac{\sum_k \left(U_{1jk} - \hat{R}_{1j} X_{1jk}\right)^2}{\bar{X}_{1j}^2 (n_{1j} - 1)} = \frac{\sum_k U_{1jk}^2 - 2\hat{R}_{1j} \sum_k \left(U_{1jk} X_{1jk}\right) + \hat{R}_{1j}^2 \sum_k X_{1jk}^2}{\bar{X}_{1j}^2 (n_{1j} - 1)}$$

D.2.3 Obtain a Truncated Z Value for each Cell (Z^*_j)

To limit the amount of cancellation that takes place between cell results during aggregation, cells whose results suggest possible favoritism are left alone. Otherwise the cell statistic is set

to zero. This means that positive equivalent Z values are set to 0, and negative values are left alone. Mathematically, this is written as

$$Z_j^* = \min(0, Z_j)$$

D.2.4 Calculate the Theoretical Mean and Variance

Calculate the theoretical mean and variance of the truncated statistic under the null hypothesis of parity, $E(Z_j^* | H_0)$ and $Var(Z_j^* | H_0)$. To compensate for the truncation in step 3, an aggregated, weighted sum of the Z^*_j will need to be centered and scaled properly so that the final aggregate statistic follows a standard normal distribution.

- If $W_j = 0$, then no evidence of favoritism is contained in the cell. The formulae for calculating $E(Z_j^* | H_0)$ and $Var(Z_j^* | H_0)$ cannot be used. Set both equal to 0.
- If $\min(n_{1j}, n_{2j}) > 6$ for a mean measure, $\min\left\{a_{1j}\left(1-\frac{a_{1j}}{n_{1j}}\right), a_{2j}\left(1-\frac{a_{2j}}{n_{2j}}\right)\right\} > 9$ for a proportion measure, $\min\left(n_{1j}, n_{2j}\right) > 15$ and $n_j q_j (1-q_j) > 9$ for a rate measure, or n_{1j} and n_{2j} are large for a ratio measure then

$$E(Z_j^* | H_0) = -\frac{1}{\sqrt{2\pi}}$$

and

$$Var(Z_j^* | H_0) = \frac{1}{2} - \frac{1}{2\pi}$$

- Otherwise, determine the total number of values for Z^*_j. Let z_{ji} and θ_{ji}, denote the values of Z^*_j and the probabilities of observing each value, respectively.

$$E(Z_j^* | H_0) = \sum_i \theta_{ji} z_{ji}$$

and

$$Var(Z_j^* | H_0) = \sum_i \theta_{ji} z_{ji}^2 - \left[E(Z_j^* | H_0)\right]^2$$

The actual values of the z's and θ's depends on the type of measure.

Mean Measure

$$N_j = \min(M_j, 1{,}000),\ i = 1,\ldots,N_j$$

$$z_{ji} = \min\left\{0, \Phi^{-1}\left(1 - \frac{R_i - 0.5}{N_j}\right)\right\} \quad \text{where } R_i \text{ is the rank of sample sum i}$$

$$\theta_j = \frac{1}{N_j}$$

Proportion Measure

$$z_{ji} = \min\left\{0, \frac{n_j\, i - n_{1j}\, a_j}{\sqrt{\frac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}\right\}, \quad i = \max(0, a_j - n_{2j}),\ldots,\min(a_j, n_{1j})$$

$$\theta_{ji} = HG(i)$$

Rate Measure

$$z_{ji} = \min\left\{0, \frac{i - n_j\, q_j}{\sqrt{n_j\, q_j (1 - q_j)}}\right\}, \quad i = 0,\ldots,n_j$$

$$\theta_{ji} = BN(i)$$

Ratio Measure

The performance measure that is in this class is billing accuracy. If a parity test were used, the sample sizes for this measure are quite large, so there is no need for a small sample technique. If one does need a small sample technique, then a re-sampling method can be used.

D.2.5 Calculate the Aggregate Test Statistic (Z^T)

$$Z^T = \frac{\sum_j W_j Z_j^* - \sum_j W_j E(Z_j^* \mid H_0)}{\sqrt{\sum_j W_j^2 \mathrm{Var}(Z_j^* \mid H_0)}}$$

The Balancing Critical Value

There are four key elements of the statistical testing process:

- the null hypothesis, H_0, that parity exists between ILEC and CLEC services
- the alternative hypothesis, H_a, that the ILEC is giving better service to its own customers

- the Truncated Z test statistic, Z^T, and
- a critical value, c

The decision rule[1] is

- If $Z^T < c$ then accept H_a.
- If $Z^T \geq c$ then accept H_0.

There are two types of error possible when using such a decision rule:

- **Type I Error**: Deciding favoritism exists when there is, in fact, no favoritism.
- **Type II Error**: Deciding parity exists when there is, in fact, favoritism.

The probabilities of each type of each are:

- **Type I Error**: $\alpha = P(Z^T < c \mid H_0)$
- **Type II Error**: $\beta = P(Z^T \geq c \mid H_a)$

We want a balancing critical value, c_B, so that $\alpha = \beta$.

It can be shown that.

$$c_B = \frac{\sum_j W_j M(m_j, se_j) - \sum_j W_j \frac{-1}{\sqrt{2\pi}}}{\sqrt{\sum_j W_j^2 V(m_j, se_j)} + \sqrt{\sum_j W_j^2 \left(\frac{1}{2} - \frac{1}{2\pi}\right)}}$$

where

$$M(\mu,\sigma) = \mu\Phi(\tfrac{-\mu}{\sigma}) - \sigma\phi(\tfrac{-\mu}{\sigma})$$

$$V(\mu,\sigma) = (\mu^2 + \sigma^2)\Phi(\tfrac{-\mu}{\sigma}) - \mu\sigma\phi(\tfrac{-\mu}{\sigma}) - M(\mu,\sigma)^2$$

$\Phi(\cdot)$ is the cumulative standard normal distribution function, and $\phi(\cdot)$ is the standard normal density function.

This formula assumes that Z_j is approximately normally distributed within cell j. When the cell sample sizes, n_{1j} and n_{2j}, are small this may not be true. It is possible to determine the cell mean and variance under the null hypothesis when the cell sample sizes are small. It is much more difficult to determine these values under the alternative hypothesis. Since the cell weight, W_j will also be small (see calculate weights section above) for a cell with small volume, the cell mean and variance will not contribute much to the weighted sum. Therefore, the above formula provides a reasonable approximation to the balancing critical value.

The values of m_j and se_j will depend on the type of performance measure.

1 This decision rule assumes that a negative test statistic indicates poor service for the CLEC customer. If the opposite is true, then reverse the decision rule.

Mean Measure

For mean measures, one is concerned with two parameters in each cell, namely, the mean and variance. A possible lack of parity may be due to a difference in cell means, and/or a difference in cell variances. One possible set of hypotheses that capture this notion, and take into account the assumption that transaction are identically distributed within cells is:

H_0: $\mu_{1j} = \mu_{2j}$, $\sigma_{1j}^2 = \sigma_{2j}^2$

H_a: $\mu_{2j} = \mu_{1j} + \delta_j \sigma_{1j}$, $\sigma_{2j}^2 = \lambda_j \sigma_{1j}^2$ $\delta_j > 0$, λ_j 1 and j = 1, ,L.

Under this form of alternative hypothesis, the cell test statistic Z_j has mean and standard error given by

$$m_j = \frac{-\delta_j}{\sqrt{\frac{1}{n_{1j}} + \frac{1}{n_{2j}}}}$$

and

$$se_j = \sqrt{\frac{\lambda_j n_{1j} + n_{2j}}{n_{1j} + n_{2j}}}$$

Proportion Measure

For a proportion measure there is only one parameter of interest in each cell, the proportion of transaction possessing an attribute of interest. A possible lack of parity may be due to a difference in cell proportions. A set of hypotheses that take into account the assumption that transaction are identically distributed within cells while allowing for an analytically tractable solution is:

$$H_0: \quad \frac{p_{2j}(1-p_{1j})}{(1-p_{2j})p_{1j}} = 1$$

$$H_a: \quad \frac{p_{2j}(1-p_{1j})}{(1-p_{2j})p_{1j}} = \psi_j \qquad \psi_j > 1 \text{ and } j = 1, ,L.$$

These hypotheses are based on the "odds ratio." If the transaction attribute of interest is a missed trouble repair, then an interpretation of the alternative hypothesis is that a CLEC trouble repair appointment is ψ_j times more likely to be missed than an ILEC trouble.

Under this form of alternative hypothesis, the within cell asymptotic mean and variance of a_{1j} are given by[1]

1 Stevens, W. L. (1951) Mean and Variance of an entry in a Contingency Table. *Biometrica*, **38**, 468-470.

$$E(a_{1j}) = n_j \pi_j^{(1)}$$

$$\text{var}(a_{1j}) = \frac{n_j}{\frac{1}{\pi_j^{(1)}} + \frac{1}{\pi_j^{(2)}} + \frac{1}{\pi_j^{(3)}} + \frac{1}{\pi_j^{(4)}}}$$

where

$$\pi_j^{(1)} = f_j^{(1)}\left(n_j^2 + f_j^{(2)} + f_j^{(3)} - f_j^{(4)}\right)$$

$$\pi_j^{(2)} = f_j^{(1)}\left(-n_j^2 - f_j^{(2)} + f_j^{(3)} + f_j^{(4)}\right)$$

$$\pi_j^{(3)} = f_j^{(1)}\left(-n_j^2 + f_j^{(2)} - f_j^{(3)} + f_j^{(4)}\right)$$

$$\pi_j^{(4)} = f_j^{(1)}\left(n_j^2\left(\frac{2}{\psi_j} - 1\right) - f_j^{(2)} - f_j^{(3)} - f_j^{(4)}\right)$$

$$f_j^{(1)} = \frac{1}{2n_j^2\left(\frac{1}{\psi_j} - 1\right)}$$

$$f_j^{(2)} = n_j n_{1j}\left(\frac{1}{\psi_j} - 1\right)$$

$$f_j^{(3)} = n_j a_j\left(\frac{1}{\psi_j} - 1\right)$$

$$f_j^{(4)} = \sqrt{n_j^2\left[4n_{1j}\left(n_j - a_j\right)\left(\frac{1}{\psi_j} - 1\right) + \left(n_j + \left(a_j - n_{1j}\right)\left(\frac{1}{\psi_j} - 1\right)\right)^2\right]}$$

Recall that the cell test statistic is given by

$$Z_j = \frac{n_j\, a_{1j} - n_{1j}\, a_j}{\sqrt{\frac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}$$

Using the equations above, we see that Z_j has mean and standard error given by

$$m_j = \frac{n_j^2 \pi_j^{(1)} - n_{1j}\, a_j}{\sqrt{\frac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}$$

and

$$se_j = \sqrt{\frac{n_j^3 (n_j - 1)}{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)\left(\frac{1}{\pi_j^{(1)}} + \frac{1}{\pi_j^{(2)}} + \frac{1}{\pi_j^{(3)}} + \frac{1}{\pi_j^{(4)}}\right)}}$$

Rate Measure

A rate measure also has only one parameter of interest in each cell, the rate at which a phenomenon is observed relative to a base unit, e.g. the number of troubles per available line. A possible lack of parity may be due to a difference in cell rates. A set of hypotheses that take into account the assumption that transaction are identically distributed within cells is:

H_0: $r_{1j} = r_{2j}$

H_a: $r_{2j} = \varepsilon_j r_{1j}$ $\varepsilon_j > 1$ and $j = 1, ,L.$

Given the total number of ILEC and CLEC transactions in a cell, n_j, and the number of base elements, b_{1j} and b_{2j}, the number of ILEC transaction, n_{1j}, has a binomial distribution from n_j trials and a probability of

$$q_j^* = \frac{r_{1j} b_{1j}}{r_{1j} b_{1j} + r_{2j} b_{2j}}$$

Therefore, the mean and variance of n_{1j}, are given by

$$E(n_{1j}) = n_j q_j^*$$
$$\text{var}(n_{1j}) = n_j q_j^* (1 - q_j^*)$$

Under the null hypothesis

$$q_j^* = q_j = \frac{b_{1j}}{b_j}$$

but under the alternative hypothesis

$$q_j^* = q_j^a = \frac{b_{1j}}{b_{1j} + \varepsilon_j b_{2j}}$$

Recall that the cell test statistic is given by

$$Z_j = \frac{n_{1j} - n_j q_j}{\sqrt{n_j q_j (1 - q_j)}}$$

Using the relationships above, we see that Z_j has mean and standard error given by

$$m_j = \frac{n_j (q_j^a - q_j)}{\sqrt{n_j q_j (1 - q_j)}} = (1 - \varepsilon_j) \frac{\sqrt{n_j b_{1j} b_{2j}}}{b_{1j} + \varepsilon_j b_{2j}}$$

and

$$se_j = \sqrt{\frac{q_j^a(1-q_j^a)}{q_j(1-q_j)}} = \sqrt{\varepsilon_j}\,\frac{b_j}{b_{1j}+\varepsilon_j b_{2j}}$$

Ratio Measure

As with mean measures, one is concerned with two parameters in each cell, the mean and variance, when testing for parity of ratio measures. As long as sample sizes are large, as in the case of billing accuracy, the same method for finding m_j and se_j that is used for mean measures can be used for ratio measures.

D.2.6 Determining the Parameters of the Alternative Hypothesis

In this section we have indexed the alternative hypothesis of mean measures by two sets of parameters, λ_j and δ_j. Proportion and rate measures have been indexed by one set of parameters each, ψ_j and ε_j respectively. A major difficulty with this approach is that more than one alternative will be of interest; for example we may consider one alternative in which all the δ_j are set to a common non-zero value, and another set of alternatives in each of which just one δ_j is non-zero, while all the rest are zero. There are very many other possibilities. Each possibility leads to a single value for the balancing critical value; and each possible critical value corresponds to many sets of alternative hypotheses, for each of which it constitutes the correct balancing value.

The formulas we have presented can be used to evaluate the impact of different choices of the overall critical value. For each putative choice, we can evaluate the set of alternatives for which this is the correct balancing value. While statistical science can be used to evaluate the impact of different choices of these parameters, there is not much that an appeal to statistical principles can offer in directing specific choices. Specific choices are best left to telephony experts. Still, it is possible to comment on some aspects of these choices:

Parameter Choices for λ_j – The set of parameters λ_j index alternatives to the null hypothesis that arise because there might be greater unpredictability or variability in the delivery of service to a CLEC customer over that which would be achieved for an otherwise comparable ILEC customer. While concerns about differences in the variability of service are important, it turns out that the truncated Z testing which is being recommended here is relatively insensitive to all but very large values of the λ_j. Put another way, reasonable differences in the values chosen here could make very little difference in the balancing points chosen.

Parameter Choices for δ_j – The set of parameters δ_j are much more important in the choice of the balancing point than was true for the λ_j. The reason for this is that they directly index differences in average service. The truncated Z test is very sensitive to any such differences; hence, even small disagreements among experts in the choice of the δ_j could be very important. Sample size matters here too. For example, setting all the δ_j to a single value – δ_j =

$\delta\angle$ might be fine for tests across individual CLECs where currently in Georgia the CLEC customer bases are not too different. Using the same value of δ for the overall state testing does not seem sensible. At the state level we are aggregating over CLECs, so using the same δ as for an individual CLEC would be saying that a "meaningful" degree of disparity is one where the violation is the same (δ) for each CLEC. But the detection of disparity for any component CLEC is important, so the relevant "overall" δ should be smaller.

Parameter Choices for ψ_j *or* ε_j – The set of parameters ψ_j or ε_j are also important in the choice of the balancing point for tests of their respective measures. The reason for this is that they directly index increases in the proportion or rate of service performance. The truncated Z test is sensitive to such increases; but not as sensitive as the case of δ for mean measures. Sample size matters here too. As with mean measures, using the same value of ψ or ε for the overall state testing does not seem sensible.

The three parameters are related however. If a decision is made on the value of δ, it is possible to determine equivalent values of ψ and ε. The following equations, in conjunction with the definitions of ψ and ε, show the relationship with delta.

$$\delta = 2 \cdot \arcsin(\sqrt{\hat{p}_2}) - 2 \cdot \arcsin(\sqrt{\hat{p}_1})$$

$$\delta = 2\sqrt{\hat{r}_2} - 2\sqrt{\hat{r}_1}$$

The bottom line here is that beyond a few general considerations, like those given above, a principled approach to the choice of the alternative hypotheses to guard against must come from elsewhere.

Decision Process

Once Z^T has been calculated, it is compared to the balancing critical value to determine if the ILEC is favoring its own customers over a CLEC's customers.

This critical value changes as the ILEC and CLEC transaction volume change. One way to make this transparent to the decision-maker, is to report the difference between the test statistic and the critical value, *diff* = Z^T - c_B. If favoritism is concluded when $Z^T < c_B$, then the *diff* < 0 indicates favoritism.

This makes it very easy to determine favoritism: a positive *diff* suggests no favoritism, and a negative *diff* suggests favoritism.

E: BST IPP Remedy Calculation Procedures

E.1 Tier-1 Calculation For Retail Analogues

1. Calculate the overall test statistic for each CLEC; $z^{T}_{CLEC\text{-}1}$.
2. Calculate the balancing critical value ($^{c}B_{CLEC\text{-}1}$) that is associated with the alternative hypothesis (for fixed parameters δ, Ψ, or ε)
3. If the overall test statistic is equal to or above the balancing critical value, stop here. That is, if $^{c}B_{CLEC\text{-}1} < z^{T}_{CLEC\text{-}1}$, stop here. Otherwise, go to step 4.
4. Calculate the Parity Gap by subtracting the value of Step 2 from that of step 1. ($z^{T}_{CLEC\text{-}1} - {}^{c}B_{CLEC\text{-}1}$)
5. Calculate the Volume Proportion using a linear distribution with slope of 1/4. This can be accomplished by taking the absolute value of the Parity Gap from step 4, divided by 4; $ABS((z^{T}_{CLEC\text{-}1} - {}^{c}B_{CLEC\text{-}1}) / 4)$. All parity gaps equal or greater to 4 will result in a volume proportion of 100%.
6. Calculate the Affected Volume by multiplying the Volume Proportion from step 5 by the Total Impacted CLEC-$_1$ Volume (I_c). The Total Impacted Volume is derived from the sum of the impacted volumes for CLEC-$_1$ in the negatively affected cells.
7. Multiply the Affected Volume by 106%
8. Calculate the payment to CLEC-1 by multiplying the result of step 7 by the appropriate dollar amount from the fee schedule.
9. Thus, CLEC-1 payment = (Affected $Volume_{CLEC1}$ * 106%) * $$from Fee Schedule.

E.1.1 Example: CLEC-1 Customer Trouble Report Rate (CTRR) for Resale POTS

Note – the statistical results are only illustrative. They are not a result of a statistical test of this data.

State	n_l	N_C	I_c	TRR_I	TRR_C	$z^{T}_{CLEC\text{-}1}$	Parity Gap	Volume Proportion	Affected Volume
	24816	143	11	3.03%	6.43%	-2.764	-1.45	0.36	
Cell						$z_{CLEC\text{-}1}$			
1		17	0	0.02	0	0.578			
2		17	4	0.04	0.24	-4.188			1
3		69	2	0.02	0.03	-0.257			1

4		5	3	0.04	0.5	-3.287			1
5		3	0	0.04	0	0.353			
6		5	0	0.03	0	0.414			
7		27	2	0.03	0.07	-1.101			1
Total			**11**					**0.36**	**4**

where n_I = ILEC observations and n_C = CLEC-1 observations

Payout for CLEC-1 is: (4 units*106%) = 4.24. Thus, 4 * ($100/unit) = $400

E.1.2 Example: CLEC-1 Order Completion Interval (OCI) for Resale POTS

State	n_I	n_C	I_c	OCI_I	OCI_C	z^T_{CLEC-1}	Parity Gap	Volume Proportion	Affected Volume
	12,296	64	60	1.03	1.36	-2.1	-0.8	0.20	
Cell						z_{CLEC-1}			
1		1	1	0.33	0.33	0			
2		1	1	0.33	0.33	0			
3		13	13	0.33	0.33	0			
4		2	2	0.33	0.33	0			
5		1	1	0.33	0.33	0			
6		6	5	1.62	2.5	-1.3			1
7		1	1	1.67	1	0.29			
8		12	11	1.6	1.9	-0.87			2
9		1	1	1.74	1	0.74			
10		10	10	0.33	0.33	0			
11		1	1	0.33	0.33	0			
12		5	4	4.08	5	-0.96			1
13		2	2	0.33	0.33	0			
14		4	4	0.33	0.33	0			
15		4	3	1.7	6	-2.18			1
Total			**23**					**0.20**	**5**

where n_I = ILEC observations and n_C = CLEC-1 observations

Payout for CLEC-1 is: (5 units*106%) = 5.30. Thus, 5 * ($100/unit) = $500.

E.2 Tier-2 Calculation For Retail Analogues

1. Tier-2 is triggered by three consecutive monthly failures of any Tier 2 Remedy Plan sub-metric.
2. Therefore, calculate monthly statistical results and affected volumes as outlined in steps 2 through 6 for the individual CLEC-$_1$ performance. Determine average monthly affected volume for the rolling 3-month period.
3. Calculate the payment to the State Designated Agency by multiplying the average monthly volume by 106%, then multiplying that result by the appropriate dollar amount from the Tier-2 fee schedule.
4. Therefore, State Designated Agency payment = (Average monthly volume * 106%) * $$ from Fee Schedule

E.2.1 Example: CLEC-A Missed Installation Appointments (MIA) for Resale POTS

State	n_I	n_C	I_c	MIA_I	MIA_C	z^T_{CLEC-A}	C_B	Parity Gap	Volume Proportion	Affected Volume
Month 1	180000	2100	337	9%	16%	-1.92	-0.21	1.71	0.4275	
Cell						z_{CLEC-A}				
1		500	56	0.091	0.112	-1.994				24
2		300	30	0.176	0.1	0.734				
3		80	27	0.128	0.338	-2.619				12
4		205	60	0.158	0.293	-2.878				26
5		45	4	0.245	0.089	1.345				
6		605	79	0.156	0.131	0.021				
7		80	19	0.166	0.238	-0.6				8
8		40	7	0.106	0.15	-0.065				3
9		165	36	0.193	0.218	-0.918				15
10		80	19	0.16	0.238	-0.66				8
Total			**224**						**0.4275**	**96**

where n_I = ILEC observations and n_C = CLEC-A observations

Assume Months 2 and 3 have the same affected volumes. Payout: (96*106%) = 101.76
Thus, 102 * $300/unit = $30,600.

E.3 Tier-1 Calculation For Benchmarks

1. For each CLEC, with five or more observations, calculate monthly performance results for the State.
2. CLECs having observations (sample sizes) between 5 and 30 will use Table I below. The only exception will be for Collocation Percent Missed Due Dates.

Table 1: Small Sample Size Table (95% Confidence)

Sample Size	Equivalent 90% Benchmark	Equivalent 95% Benchmark	Sample Size	Equivalent 90% Benchmark	Equivalent 95% Benchmark
5	60.00%	80.00%	18	77.78%	83.33%
6	66.67%	83.33%	19	78.95%	84.21%
7	71.43%	85.71%	20	80.00%	85.00%
8	75.00%	75.00%	21	76.19%	85.71%
9	66.67%	77.78%	22	77.27%	86.36%
10	70.00%	80.00%	23	78.26%	86.96%
11	72.73%	81.82%	24	79.17%	87.50%
12	75.00%	83.33%	25	80.00%	88.00%
13	76.92%	84.62%	26	80.77%	88.46%
14	78.57%	85.71%	27	81.48%	88.89%
15	73.33%	86.67%	28	78.57%	89.29%
16	75.00%	87.50%	29	79.31%	86.21%
17	76.47%	82.35%	30	80.00%	86.67%

3. If the percentage (or equivalent percentage for small samples) meets the benchmark standard, stop here. Otherwise, go to step 4.
4. Determine the Volume Proportion by taking the difference between the benchmark and the actual performance result.
5. Calculate the Affected Volume by multiplying the Volume Proportion from step 4 by the Total Impacted CLEC-$_1$ Volume.
6. Calculate the payment to CLEC-1 by multiplying the result of step 5 by the appropriate dollar amount from the fee schedule.
7. CLEC-1 payment = Affected Volume$_{CLEC\text{-}1}$ * $$from Fee Schedule

E.3.1 Example: CLEC-1 Percent Missed Due Dates for Collocations

	n_C	Benchmark	MIA_C	Volume Proportion	Affected Volume
State	600	10%	13%	.03	18

Payout for CLEC-1 is (18 units) * ($5000/unit) = $90,000

E.4 Tier-1 Calculation For Benchmarks (In The Form Of A Target)

1. For each CLEC with five or more observations calculate monthly performance results for the State.
2. CLECs having observations (sample sizes) between 5 and 30 will use Table I above.
3. Calculate the interval distribution based on the same data set used in step 1.
4. If the 'percent within' (or equivalent percentage for small samples) meets the benchmark standard, stop here. Otherwise, go to step 5.
5. Determine the Volume Proportion by taking the difference between benchmark and the actual performance result.
6. Calculate the Affected Volume by multiplying the Volume Proportion from step 5 by the Total CLEC-$_1$ Volume.
7. Calculate the payment to CLEC-1 by multiplying the result of step 6 by the appropriate dollar amount from the fee schedule.

CLEC-1 payment = Affected $Volume_{CLEC1}$ * $$from Fee Schedule

E.4.1 Example: CLEC-1 Reject Timeliness

	n_C	Benchmark	Reject Timeliness	Volume Proportion	Affected Volume
State	600	95% within 1 hour	93% within 1 hour	.02	12

Payout for CLEC-1 is (12 units) * ($100/unit) = $1,200

E.5 Tier-2 Calculations For Benchmarks

Tier-2 calculations for benchmark measures are the same as the Tier-1 benchmark calculations, except the CLEC Aggregate data having failed for three months.

F: Reposting Of Performance Data and Recalculation of SEEM Payments

BellSouth will make available reposted performance data as reflected in the Service Quality Measurement (SQM) reports and recalculate Self-Effectuating Enforcement (SEEM) payments using the Parity Analysis and Remedy Information System (PARIS), to the extent technically feasible, under the following circumstances:

1. Those measures included in a state's specific SQM plan with corresponding sub-metrics are subject to reposting. A notice will be placed on the PMAP website advising CLECs when reposted data is available.

2. Performance sub-metric calculations that result in a shift in the performance in the aggregate from an "in parity" condition to an "out of parity" condition will be available for reposting.

3. Performance sub-metric calculations with benchmarks that are in an "out of parity" condition will be available for reposting whenever there is a >= 2% decline in BellSouth's performance at the sub-metric level.

4. Performance sub-metric calculations with retail analogues that are in an "out of parity" condition will be available for reposting whenever there is a decline in performance as shown by an adverse change of <= .5 in the z-score at the sub-metric level.

5. Any data recalculations that reflect an improvement in BellSouth's performance will be reposted at BellSouth's discretion. However, statewide performance must improve by at least 2% for benchmark measures and the z-score must improve by at least 0.5 for retail analogs at the sub-metric level to qualify for reposting.

6. Performance data will be made available for a maximum of three months in arrears.

7. When updated performance data has been made available for reposting or when a payment error in PARIS has been discovered, BellSouth will recalculate applicable SEEM payments. Where technically feasible, SEEM payments will be subject to recalculation for a maximum of three months in arrears from the date updated performance data was made available or the date when the payment error was discovered.

8. Any adjustments for underpayment of Tier 1 and Tier 2 calculated remedies will be made consistent with the terms of the state specific SEEM plan, including the payment of interest. Any adjustments for overpayment of Tier 1 and Tier 2 remedies will be made at BellSouth's discretion.

9. Any adjustments for underpayments will be made in the next month's payment cycle after the recalculation is made. The final current month PARIS reports will reflect the transmitted dollars, including adjustments for prior months where applicable. Questions regarding the adjustments should be made in accordance with the normal process used to address CLEC questions related to SEEM payments.

STATE OF SOUTH CAROLINA)
) CERTIFICATE OF SERVICE
COUNTY OF RICHLAND)

The undersigned, Nyla M. Laney, hereby certifies that she is employed by the Legal Department for BellSouth Telecommunications, Inc. ("BellSouth") and that she has caused BellSouth Telecommunications, Inc.'s Notice of Filing a Revised Incentive Payment Plan in Docket No. 2001-209-C to be served upon the following this June 28, 2004:

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PC Docs # 401224